

REMARKS

Claim Rejections – 35 USC § 103

3. Claims 1, 3-8 and 28-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Franklin (5,602,343) or Ansaldi et al. (4,475,406) or Allen et al. (4,442,719) in view of Phillips et al. (5,522,393).

In the office action, the Examiner has rejected claims 1, 3-8 and 28-34. It is noted, however, that claims 1, 3-8 and 25-31 were pending. It is assumed that the Examiner's references to claims 25-31 apply to claims 28-34.

The Examiner rejected claims 1, 3-8 and 28-34 (sic) under 35 U.S.C. § 103(a) as being unpatentable over Franklin (5,602,343) or Ansaldi et al. (4,475,406) or Allen et al. (4,442,719) in view of Phillips et al. (5,522,393). The Examiner's rejection of claims 1, 3-8 and 25-31 (28-34, as described in Examiner's remarks) is respectfully traversed.

Claim 1 recites, among other things, a method for measuring displacement of a fluid in a conduit having two transducers offset along a main axis of the conduit. The method includes at least the steps of simultaneously exciting the two transducers; simultaneously measuring signals received at each one of the transducers originating from the other transducer; synchronously digitizing the signals received at each one of both transducers; and calculating a difference in ultrasound transit time between the two transducers in one direction and in the other. Claim 25 further recites calculating said difference in ultrasound transit time between the two transducers in one direction and in the other by intercorrelating the received signals, calculating the Hilbert transform thereof and seeking the zeros of the Hilbert transform.

The Examiner contends that a combination of Franklin, Ansaldi and Allen teach 1) simultaneously exciting two transducers and 2) simultaneously measuring the received signals and calculating the transit time (phase difference) between the two transducers.

Whether or not this is the case, the cited references do not show, and the Examiner has not suggested in his remarks that the cited references show, all of the steps of Applicants' invention as claimed. For example, the cited references do not show, and the Examiner has not suggested in his remarks that the cited references show, the step of synchronously digitizing the signals received at each one of both transducers. When applying 35 U.S.C. § 103, the claimed

invention must be determined as a whole. MPEP §§ 2141, 2141.02; *see also* MPEP § 706.02(j) (“[T]he prior art reference (or references when combined) must teach or suggest all the claim limitations.”)

For the Examiner to make out a *prima facie* case of obviousness there must be some teaching, suggestion or incentive to combine the references and make the modifications proposed by the Examiner. See, e.g., *In re Fritch*, 972 F.2d 1260, 1265 (Fed.Cir.1992) (examiner can satisfy burden of obviousness in light of combination “only by showing some objective teaching [leading to the combination]”); MPEP § 2143. Even if a combination is proper, all of the limitations recited in the claim must be taught or suggested by the prior art. If even a single limitation is absent, the rejection is improper. See generally MPEP § 2143.03.

The Examiner concedes that Franklin, Ansaldi and Allen do not teach synchronously digitizing the received signals at each one of both transducers. The Examiner contends, however, that it would have been obvious to a person having ordinary skill in the art at the time the invention was made to use an A/D converter to digitize the signals received at the transducers because, the Examiner contends, such A/D conversion would be “simple [and/or] required in order to digitally display the data electronically on the screen.”

The Examiner has provided no objective evidence supporting the assertion that synchronous digitization of signals received at two transducers would have been obvious to one skilled in the art, and, in fact, the evidence provided by the Examiner (i.e., the Franklin reference) suggests the opposite conclusion. As the Examiner concedes, while Franklin, Ansaldi and Allen teach simultaneous measurement of two received signals, these references expressly teach analog analysis of analog signals. They do not teach digitizing signals, synchronously or otherwise, or employing any digital analysis, and at least one reference appears to teach away from digitizing the received signals.

Moreover, in his comments the Examiner asserts that one skilled in the art would be motivated to convert to synchronously digitize received signals, as in the claimed invention, to digitally display the data electronically on a screen. However, the knowledge of one skilled in the art with respect to the use of A/D conversion for the purpose of display on a screen is

inapplicable. This is not a case of conversion for display purposes. The claimed invention relates to time measurement and not display. The two are not the same. It thus may not have been obvious to one of ordinary skill to use an A/D converter to digitize the signals received at the transducers.

Applicants respectfully submit that whether or not any of the cited references shows A/D conversion, as Examiner contends, is beside the point. With respect to Franklin, the undersigned respectfully suggests that the reference would lead one skilled in the art away from the claimed invention. A prior art reference must be considered in its entirety, including those portions that would teach away from the claimed invention. MPEP § 2141.02. Franklin teaches that “prior art fluid velocity measuring systems employed elaborate signal processing to measure and compare transit times” (col. 1, lines 23-25), and suggests that the “method and apparatus of [Franklin] greatly simplify the processing of signals, and the determination of the fluid velocity” (col. 1, lines 63-65). Use of an A/D converter to digitize the signals received at the transducers would have required a complicated digital signal processor that would not “simplify the processing of signals.” In addition, Allen advises totally against determining the fluid speed by calculating directly the time difference. (col. 1, lines 44-54) As such, the cited references would lead one skilled in the art away from digitizing the received signals and utilizing digital signal processing.

In his comments, the Examiner cites Phillips for the proposition that Phillips teaches intercorrelation and the Hilbert transform of the intercorrelation. It is noted that claim 1 does not recite use of a Hilbert transform. Nevertheless, the undersigned has reviewed Phillips and, based on the undersigned’s understanding of Phillips, Phillips, alone or in combination with the other references, fails to teach or suggest all of the elements of claim 1.

For at least the reason that the prior art does not show the step of synchronously digitizing the signals received at each one of both transducers, the Examiner’s rejection of claim 1 (and all of its dependent claims) under 35 U.S.C. § 103 is improper. It is thus respectfully requested that the Examiner withdraw his rejection of claims 1 and 3-8.

Next, the Examiner contends that Phillips teaches intercorrelation and calculating the Hilbert transform of intercorrelation and seeking the zeros of the Hilbert transform. The Examiner suggests it would have been obvious to one of ordinary skill to use the teaching of Phillips in the device of Franklin, Ansaldi or Allen because, the Examiner contends, such correlation helps in achieving reliable measurement results and the Hilbert transform of the intercorrelation would avoid unnecessary complicated circuitry.

Claims 4-5 and 25-31 further recite calculating the Hilbert transform of intercorrelated signals, and seeking zeros of the Hilbert transform. Phillips fails to teach calculating the Hilbert transform of intercorrelated signals, and seeking zeros of the Hilbert transform, as recited by these claims, and for this separate and independent reason claims 4-5 and 25-31 are allowable.

It is respectfully submitted that, because the prior art Phillips reference cited by the Examiner, both alone and in combination with the purported teaching of the prior art (as set forth in the section entitled "Claim Rejections – 35 USC § 103" of the Office Action), does not disclose or suggest use of the Hilbert transform of intercorrelation of received signals, and specifically seeking the zeros of the Hilbert transform of such intercorrelation, as is recited by claim 25, the Examiner's rejection of independent claims 1 and 25, and the claims that depend therefrom, under 35 U.S.C. § 103 is not supported. It is respectfully requested that the Examiner withdraw the claim rejection and allow the claims.

Furthermore, where the Examiner's combination requires that the cited references be modified to support the Examiner's claims of obviousness, the Examiner's burden is greater and there must be some objective reason to combine the teachings of the references. See MPEP 2143.01.

A statement that modifications of the prior art to meet the claimed invention would have been "well within the ordinary skill of the art at the time the claimed invention was made" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993); see also *In re Kotzab*, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000) (Court reversed obviousness rejection involving technologically simple concept because there was no finding as to the

principle or specific understanding within the knowledge of a skilled artisan that would have motivated the skilled artisan to make the claimed invention); *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 50 USPQ2d 1161 (Fed. Cir. 1999) (The level of skill in the art cannot be relied upon to provide the suggestion to combine references.).

MPEP 2143.01 (emphasis added).

The undersigned respectfully submits that the Examiner has not met his burden of providing objective evidence in support of the Examiner's conclusion of obviousness and, accordingly, it is respectfully requested that the rejections be withdrawn.

With respect to claims 4-5 and 25-31 which recite use of the Hilbert transform, Applicants respectfully submit that it would not have been obvious to one of ordinary skill in the art to use the teaching of Phillips in the devices of Franklin, Ansaldi or Allen. First, Phillips does not teach calculating the Hilbert transform of intercorrelation and does not teach seeking the zeros of the Hilbert transform. Second, calculation of the Hilbert transform of intercorrelation and seeking the zeros of the Hilbert transform provide the best results only when the signals are almost identical, and therefore of short period, apart from the time shift. Moreover, nearly identical signals are very difficult to obtain with a pulse train of long period from which the phase difference is to be determined, such as is suggested in the cited references. The cited references, however, offer no suggestion to find, achieve or obtain such periodicity before performing the Hilbert transform. For at least these reasons, the methods of signal processing in Franklin, Ansaldi, Allen and Phillips are thus very different from any notion of using the Hilbert transform and seeking the zeros as in the claimed invention.

While Phillips mentions the Hilbert transform, it is used in a different way and there is no teaching to apply Phillips's technique in the devices of Franklin, Ansaldi or Allen.

Specifically, in Phillips, the Hilbert transform is used in the frame of the measurement of reflected echoes of the Doppler effect. In Applicants' invention, the Hilbert transform is used in connection with measurement of the transit time of signals received at transducers. Phillips's technique is therefore different from that of Applicants. The application of the Hilbert transform in Phillips consists in calculating the mean values and the variances (col. 8, lines 11-28), which

is very much distinct from measurement of the transit time by intercorrelation and determination of the zero crossing between two signals as similar as possible, with only a timeshift.

Additionally, the arrangement of the transducers in Phillips, the transducers themselves and the compared signals cannot be compared with Applicants' invention. Phillips teaches only multitransducers surfaces, and one of the signals upon which the Hilbert transform is applied does not come directly from a transducer but is an echo with Doppler effect. The present invention teaches two transducers offset along a main axis of the conduit and simultaneously measuring signals received at each one of the transducers originating from the other transducer. As a result, Phillips's use of the Hilbert transform does not teach or suggest calculation of the Hilbert transform of the intercorrelation of signals received at transducers, as recited in the present application.

The undersigned respectfully disagrees with the Examiner's conclusion that "it would have been obvious to a person having ordinary skill in the art at the time the invention was made to use the teaching of Phillips in the device [sic] of Franklin, Ansaldi or Allen since such correlation helps in achieving reliable measurement results." The Examiner's position seems to be that merely because a reference teaches calculating the Hilbert transform of the intercorrelation of signals and seeking the zeros of said Hilbert transform it would obviously be advantageous to have performed such steps in the context of the devices of Franklin, Ansaldi or Allen. The undersigned respectfully submits that this is not the case, as to do so first would require synchronously digitizing the received signals, and would also require nearly identical, and therefore short period, signals. Accordingly, it cannot be said that simply calculating the Hilbert transform of the intercorrelation of signals and seeking the zeros of said Hilbert transform would have been "obvious."

The undersigned respectfully submits that a conclusion of the "obviousness" should be supported by some objective evidence. However, the Examiner has provided no objective support for his conclusion. The undersigned submits that this appears to be a case in which the Examiner's conclusion of "obviousness" is merely based on an application of hindsight

reasoning gained by the Examiner's review of the present application. Such hindsight reasoning is impermissible. As the MPEP notes:

The tendency to resort to "hindsight" based upon applicant's disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

MPEP 2142. Furthermore, MPEP 2143 states:

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

MPEP 2143.

However, here again, the Examiner has not cited where in the prior art there is a teaching or suggestion to make the claimed combination. It follows then that if the teaching to make the combination is not found in the prior art, then such a teaching may have been impermissibly derived from applicant's disclosure. The undersigned respectfully requests that the Examiner either withdraw his rejection of the claims or provide some objective evidence of a teaching found in the prior art to make the combination made by the Examiner.

Thus, there is no objective teaching to apply Phillips's use of the Hilbert transform with Franklin, Ansaldi and Allen to obtain the inventions recited in the claims. As such, Applicants respectfully submit that notice to the effect that claims 1, 3-8 and 25-31 (28-34, as described in Examiner's remarks) are in condition for immediate allowance is respectfully requested.

In the present application, applicants submit that the Examiner has failed to make out a *prima facie* case of obviousness; accordingly, the Examiner's rejection under § 103 is not supported and it is respectfully requested that it be withdrawn.

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Rey (4,391,150) and (4,312,238) teach simultaneous application of an ultrasonic burst to two transducers and simultaneously receiving the signals.

The undersigned has reviewed the Rey references and believes that the Rey references, alone or in combination with other cited art, would not anticipate or render obvious the claimed invention under 35 U.S.C. §§ 102 or 103.

Application No. 09/719,907
Reply to the Office Action of April 20, 2004

CONCLUSION

For the foregoing reasons, allowance of this application, as amended, is courteously urged.

Claims 1, 3-8 and 25-31 (28-34, as described in Examiner's remarks) are now pending and believed to be in condition for allowance. Applicants respectfully requests that all pending claims be allowed.

Early and favorable action is respectfully requested.

Please apply any credits or excess charges to our deposit account number 50-0521.

Respectfully submitted,

Date: October 20, 2004



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